

# Enhanced Fabrication Processes Development for High Actuator Count Deformable Mirrors, Phase II

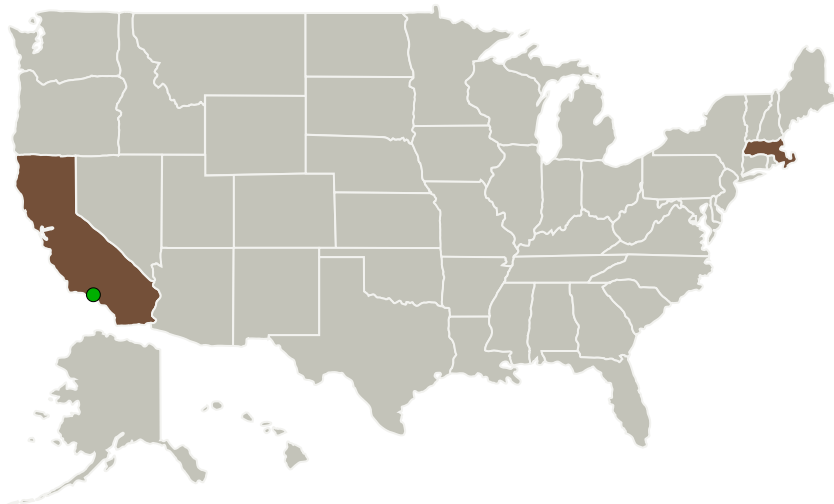
Completed Technology Project (2011 - 2013)



## Project Introduction

We propose to design and fabricate a MEMS micromirror array consisting of 1021 ultra-flat, close-packed hexagonal mirror elements, each capable of 6mrad of tip and tilt, and 1.7 $\mu$ m of piston (TTP) motion with sub-nanometer precision as required for a space-based telescope using a hyper-contrast coronagraph for terrestrial planet finding. Fabrication process enhancements developed in the Phase I effort to increase device yield by significantly reducing the defect density in polysilicon films and reduce wafer bow by modifying thin film deposition processes, will be integrated in to the DM fabrication process to produce a device with 100% actuator yield and an unpowered peak-to-valley surface figure error of <500nm - well within the dynamic range of the DM actuators. This large array of mirror segments with tip-tilt-piston degrees of freedom and  $\lambda/100$  optical quality would constitute a significant technological advance and would become an enabling component for the high contrast visible nulling coronagraph instruments planned for exoplanet imaging missions.

## Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Boston Micromachines Corporation	Lead Organization	Industry	Cambridge, Massachusetts
● Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations	
California	Massachusetts

## Project Transitions

**June 2011:** Project Start**July 2013:** Closed out**Closeout Documentation:**

- Final Summary Chart(<https://techport.nasa.gov/file/138841>)

## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Organization:**

Boston Micromachines Corporation

**Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

Carlos Torrez

**Principal Investigator:**

Steven A Cornelissen

**Co-Investigator:**

Steven Cornelissen

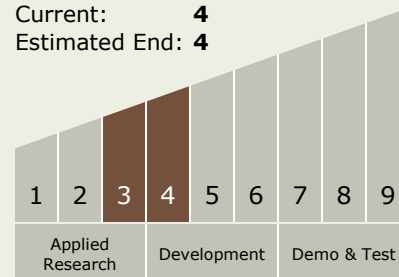
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### Technology Maturity (TRL)

Start: **3**  
Current: **4**  
Estimated End: **4**



### Technology Areas

#### Primary:

- TX08 Sensors and Instruments
  - └ TX08.2 Observatories
    - └ TX08.2.1 Mirror Systems

### Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System